

Claims

- [c1] 1. An omnidirectional inertial switch, comprising:
- a substrate die including a generally centrally located pedestal, a trough area surrounding the pedestal, a perimeter land area surrounding the trough area, a bottom ring electrode disposed in the trough area and a contact lead connected to the bottom ring electrode;
- a bottom switch assembly disposed on the substrate die, the bottom switch assembly including a conductive device layer and a conductive link, the device layer including a generally centrally located anchor, at least one spring, a proof mass connected to the anchor by the at least one spring and located opposite the bottom ring electrode, at least one contact electrode disposed radially outward from the proof mass and a contact lead connected to the at least one contact electrode, the conductive link being disposed on the anchor; and
- a cover plate assembly disposed on the bottom switch assembly, the cover plate assembly including a top plate, a non-conductive spacer disposed between the top plate and the bottom switch assembly, a center electrode that contacts the conductive link and a top ring electrode located opposite the proof mass;
- wherein an x-axis gap and a y-axis gap are defined between the proof mass and the at least one contact electrode, a bottom z-axis gap is defined between the bottom ring electrode and the proof mass and a top z-axis gap is defined between the top ring electrode and the proof mass.
- [c2] 2. The switch of claim 1 wherein the conductive link comprises a solder ball.
- [c3] 3. The switch of claim 1 wherein a thickness of the pedestal and a thickness of the perimeter land area are the same.
- [c4] 4. The switch of claim 1 wherein the at least one spring comprises four springs.
- [c5] 5. The switch of claim 1 wherein the at least one contact electrode is a single contact electrode and wherein the single contact electrode surrounds the proof mass.
- [c6] 6. The switch of claim 1 wherein the proof mass has a shape of an annular square.

- [c7] 7.The switch of claim 6 wherein the at least one contact electrode comprises four separate contact electrodes, each of the four contact electrodes connected to a respective contact lead, and wherein the four contact electrodes are located at respective corners of the proof mass.
- [c8] 8.The switch of claim 1 wherein the top and bottom z-axis gaps are the same.
- [c9] 9.The switch of claim 1 wherein the top and bottom z-axis gaps are different.
- [c10] 10.The switch of claim 1 wherein the x, y and z-axis gaps are in a range of about 0.0001 inches to about 0.01 inches.
- [c11] 11.The switch of claim 1 wherein the switch is normally open.
- [c12] 12. The switch of claim 1 wherein a size of the switch is in a range of about one cubic mm to about five cubic mm.